Numerical and Physical Modeling of the Response of Resonator Liners to Intense Sound and High Speed Grazing Flow, Phase I

Completed Technology Project (2009 - 2009)

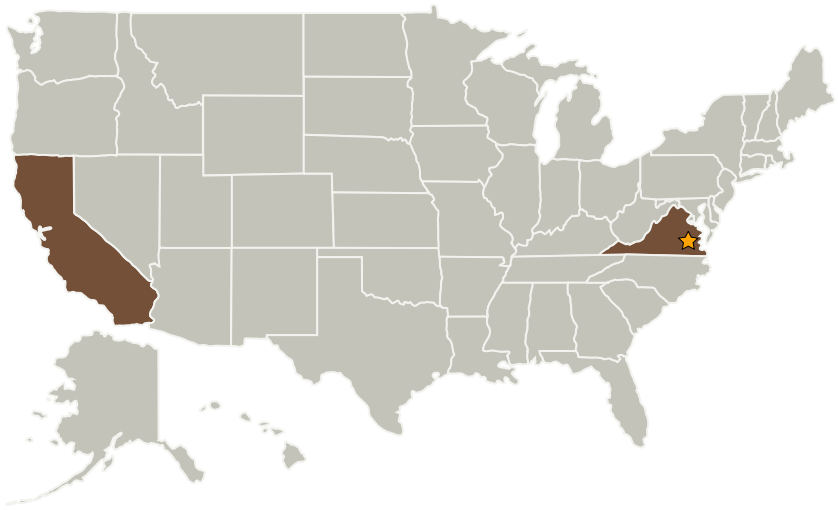
Project Introduction

An innovative research program is proposed that numerically and physically models the response of resonator liners to intense sound and high speed grazing flow. The research program is divided into two parts. Part 1 addresses the feasibility of performing direct numerical simulation (DNS) of the sound and flow fields of the following: (i) one-slit and two-slit resonators in a normal incidence impedance tube, (ii) adjust and modify the computational algorithm and mesh design to allow the code to perform high temperature simulations, and (iii) use the simulation codes to initiate a study of the performance of high temperature liners. Part 2 develops the following: (iv) a grazing flow multi-slit orifice resonator impedance model, (v) a grazing flow 1-dof multi-circular orifice resonator impedance model and (vi) a 2-dof non-grazing flow multi-circular orifice resonator impedance model. The research program was motivated, in part, by high oil prices that place ever greater demands upon the near-term need to provide aircraft engine acoustic engineers with reasonably accurate tools to design optimized liners and the long-term need to develop sophisticated computational codes to provide physical understanding of the interaction between incident intense sound and grazing flow on resonator liners

Anticipated Benefits

The resonator liner software can be used to design efficient sound absorbing liners that operate with low static pressue losses for manufactures of HVAC duct noise suppressors, space heaters and air conditioners.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Hersh Acoustical Engineering, Inc.	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Calabasas, California

Primary U.S. Work Locations	
California	Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Michael G Jones

Principal Investigator:

Alan Hersh

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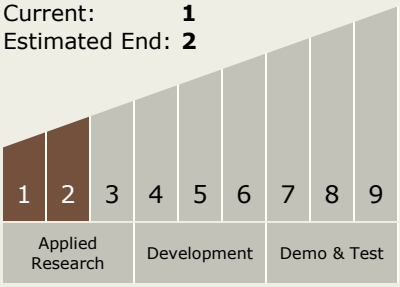
Technology Maturity (TRL)

Start: **1**
Current: **1**
Estimated End: **2**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL